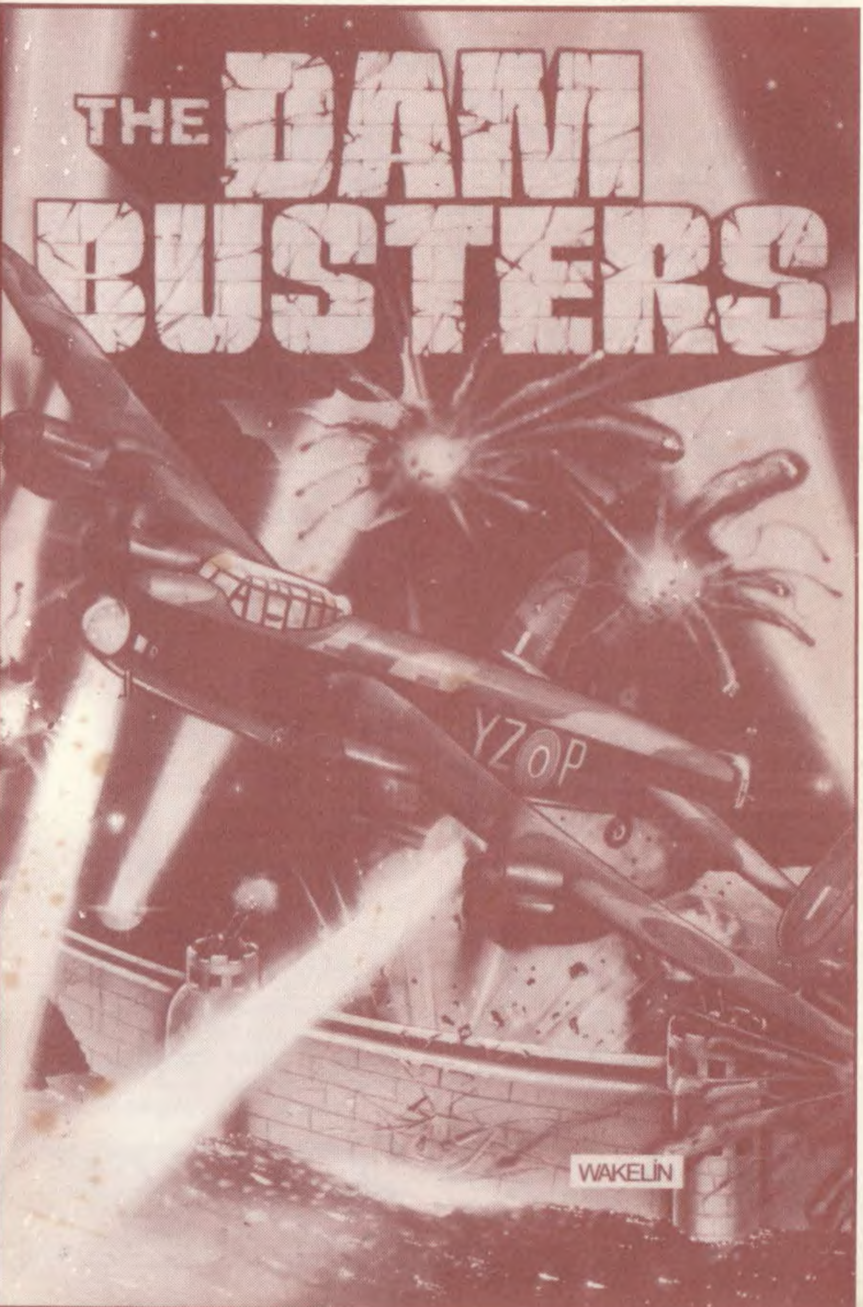

THE DAM BUSTERS
YZOP
WAKELIN

GAME DESCRIPTION

OPTIONS

The options that may be selected are:
Practice Dam Run—starting near the dam, with no enemy action.
Flight Lieutenant—starts from the English Channel.
Squadron Leader—takes off from Scampton Airfield.

The "Squadron Leader" option requires more skill in game play.

ROLES (SCREEN DESCRIPTIONS, JOYSTICK, FIRE BUTTONS)

All flight crew positions (points of view) are controlled by the player. The positions and their associated numbers are:

1—Pilot
2—Front Gunner
3—Tail Gunner
4—Bomb Aimer
5—Navigator
6—First Engineer screen
7—Second Engineer screen
(in Squadron Leader option)
8—Status and damage report

To select a position, press the appropriate number on the keyboard.

When a specific position is in trouble or needs attention, the corresponding number will flash at the bottom of the screen.

PILOT

The pilot screen is used to control the direction of the aircraft: left, right, up, down. The joystick control behaves like a real Lancaster. When you pull back the aircraft goes up, push forward the aircraft goes down, left=left, right=right.

The pilot's screen contains a view of the horizon lights, enemy barrage balloons, searchlights and ME110 night fighters. (This view also appears in the Front and Tail Gunners' screens). It also includes several instruments (see Fig. 1).

The left side of the pilot's screen contains the altimeter that measures how far the aircraft is off the ground. The altimeter shows two indicators. The smaller indicator measures 100-foot increments while the larger measures 5-foot increments (Fig. 2). When "Intercom" blinks 1 (pilot's position) you are too low. Fly over 100 feet.

The second instrument from the left is the Directional Compass for the aircraft. This tells the pilot what direction the aircraft is heading relative to magnetic North. The small red marker that moves on the top of the compass is the direction that the navigator has selected the aircraft to fly (see NAVIGATOR).

The next instrument is the Artificial Horizon Indicator (second right) which shows which direction the aircraft is turning. (This instrument is useful at night when the real horizon is not visible).
The far right instrument is the Airspeed Indicator (Fig. 3). The dials are shown in the figures below.

FIGURE 1

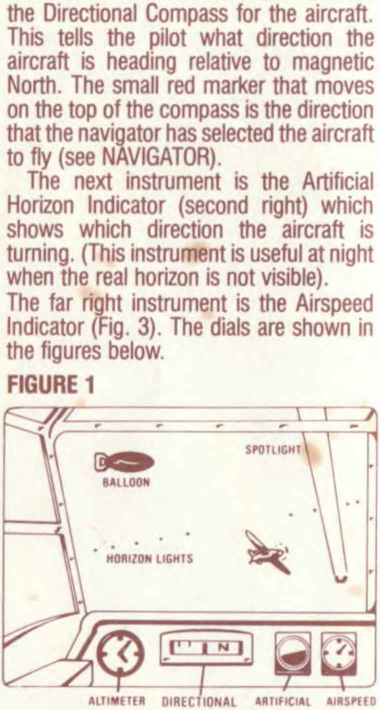


FIGURE 2

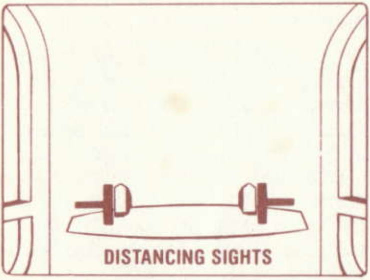
FIGURE 3

FRONT GUNNER

The Front Gunner controls the twin 303 calibre F.N.5 machine guns by guiding the cross hairs with the joystick, and pressing the fire button. The guns fire 20 rounds per second. Every fourth round fired from the guns is a tracer bullet which "glows" as it travels away from the aircraft, so that the direction and target of fire can be determined.

If the bomb rotation switch in the Bomb Aimer screen has been turned on and the bomb has reached the specified 500 rpm, the gun cross hairs will be replaced by the bomb distancing sights (see Fig. 4). The sights are used to determine the distance from aircraft to dam. To release the bomb, the front gunner should press the fire button when the distancing sights are aligned with the dam towers. Align the sights with the dam by moving the joystick left or right. (see Fig. 4).

FIGURE 4



TAIL GUNNER

The Tail Gunner controls four F.N.20 303 calibre machine guns, two mounted on either side of the turret. The guns are controlled in the same way as those of the front gunner (see Fig. 5).

BOMB AIMER

In the Lancaster, the Bomb Aimer is also the Front Gunner. The Bomb Aimer need be accessed only on the dam approach. The instruments at the bottom of the screen are the Bomb Rotation switch (left) and the Aircraft Altitude Spotlight switch (right) (see Fig. 6). To select a switch, move the joystick left or right. Under the selected control, a black control dot will appear. Press the fire button on the joystick to grab control of the switch. With the fire button pressed, move the joystick **up** to turn the switch **on** or **down** to turn it **off**. Releasing the fire button releases the control of the switch.

When the spotlight switch is on and the altitude is less than 100 feet (at higher altitudes the spotlights cannot be seen), use the joystick to adjust the altitude, just like the pilot's joystick control (forward is less altitude, back is more altitude). Avoid turning on the spotlights over enemy territory because the Lancaster will become an easy target for enemy flak.

FIGURE 5

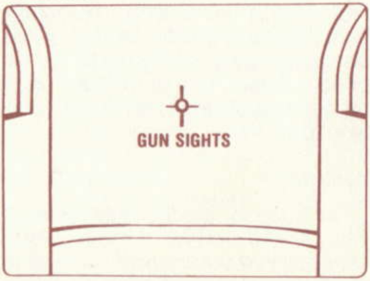
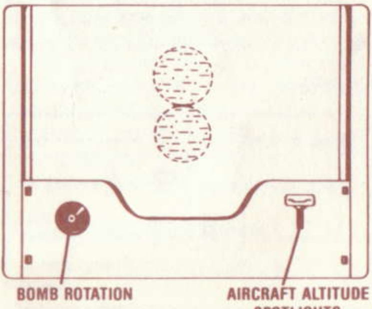


FIGURE 6



Just before the dam approach, turn on the Bomb Rotation switch. When the bomb has reached maximum rotation, the Front Gunner will no longer control the front gun, but will be looking at the distancing sights in preparation for the bomb release. Turning off the bomb rotation frees the front gunner to man the twin 303's.

NAVIGATOR

The Navigator has the most important job of the whole mission, the responsibility of plotting the course through enemy territory to the dams. The Navigator's screen shows a map on which there are two moveable objects (see Fig. 12). One shows the current aircraft position. The other shows the navigational cursor that is used to set the compass heading. The joystick controls where the navigational cursor goes on the current map. There are six maps comprising most of Northern Europe, each selected by moving the cursor toward a map edge. As the map boundary is reached, the next map, if there is one, will be displayed. Press the fire button to switch between the map showing your current location and the map showing your destination. As you move the cursor around the screen the heading of the compass at the top of the screen will change. This new heading will be reflected in the pilot's screen and indicated by the red directional marker on the top of the pilot's compass. Thus if the cursor is directly above the position of the aircraft, the navigator's compass heading will read N (north). The pilot then should bank (turn) until the aircraft direction compass is aligned to the red marker which will also be N (north).

The maps of Europe contain different coloured symbols representing the location and types of landmarks (see Fig. 7). The symbols are classified as follows:

Green circles—military installations
Red aircraft—military airport
Violet diamonds—population centres
Blue smoke stacks—industrial complexes

The size of the symbol is an indication of the concentration and magnitude of the installation. The novice should look over these maps carefully before choosing a course to fly.

ENGINEER

The engineer controls one or two screens, depending on whether Flight Lieutenant option (one screen) or Squadron Leader option (two screens) has been chosen. The first screen (Fig. 8) is associated with the control of the engines. It is the same for both options. The second screen (for Squadron Leader option only) is associated with take off and controlling trim on the rudder.

The first screen contains four throttles (bottom left), four booster controls

FIGURE 7

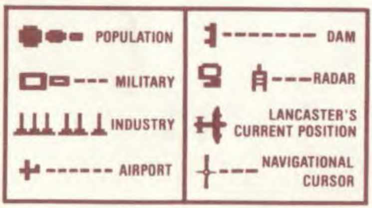


FIGURE 8

FIGURE 9

FIGURE 10

(bottom right), and four engine fire extinguishers (top right). The booster gauges are the upper four dials. The lower four dials are the rpm gauges for the throttles. A fire in an engine is indicated by a blinking rpm gauge for that engine.

To access an instrument move the joystick left, right, up or down. Under the selected control a black control dot will appear. Press the fire button on the joystick to grab control of the instrument. With the fire button pressed, move the joystick up or down depending on what you want to do. Releasing the fire button releases the control of the instrument. The four throttles may be controlled simultaneously, as may the four boosters. To do this select the position between the second the third throttles or boosters and press the fire button as before.

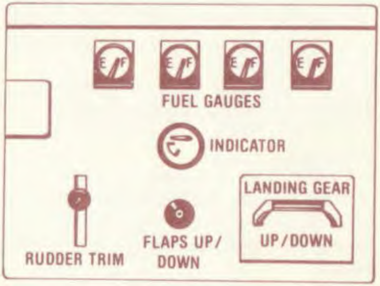
The upper right section of the screen controls the fire extinguisher for each engine. Each fire extinguisher may be used only once, so be careful using them. Press the fire button and move the joystick down to extinguish an engine fire. This action permanently disables the engine.

The throttles control the rpm on a specific engine much like an accelerator pedal on a car. The booster controls the pitch of the propeller blades in relation to the airstream near the propeller. Thus a larger pitch takes a larger bit of air. Setting a booster is similar to selecting a gear in a transmission. Thus the speed of the aircraft can be set by any combination of booster/throttle settings. The fastest airspeed is achieved by a combination of boost (high gear) and maximum throttle (pedal to the floor).

Damaged engines can be a result of "revving" the engines too high and using the throttle without adjusting the appropriate booster (putting it in gear). Too much boost with a low throttle setting will result in inefficient engines and low power, reducing the airpeed. If the boosters are set higher than the throttles, too much force is required from the engines and the rpm's will drop. Conversely, if the boosters are set lower, the engines are free to rotate and will spin out of control. They will eventually over-rev and burn out. An engine is over-revving if the rpm needle is in the red zone of the dial. It will flash. Reduce the throttles immediately. If the throttles will not reduce, it is too late—the engine has caught fire. Use the fire extinguisher. Thus individual gauges should be watched when increasing/decreasing the booster and throttle (see Fig. 9 and Fig. 10).

The Second Engineer's screen (see Fig. 11), which is only displayed for the

FIGURE 11



Squadron Leader option, shows the flap control with indicator (bottom centre), landing gear (bottom right), and rudder trim (bottom left). These instruments are controlled in a similar manner to the First Engineer's screen. The flap switch will turn on/off the flaps. The flaps are retractable extensions of the wing of the Lancaster, thus when the flaps are down, the wing area is larger and as a result the lift of the wing is increased.

The landing gear control activates the hydraulic motor control that lifts the gear.

The rudder trim adjusts the direction of the aircraft to the left or right. Moving the stick up introduces a small positive yaw in the aircraft, guiding it slightly to the right. Moving the stick down introduces a negative yaw that turns the aircraft to the left.

STATUS AND DAMAGE

This screen provides you with status information on how many flak hits, Me110

night fighters, searchlights, and barrage balloons you have been attacked by and how many you have destroyed. The searchlight counter counts how many searchlights found your Lancaster.

Also provided is information about damage to various parts of the Lancaster—the four engines, altitude spotlights and the trim. Being hit by flak or getting caught in the spotlight and drawing enemy anti-aircraft fire can jam the trim, break the altitude spotlights, or cause engine damage. Your engines may be damaged by night fighters. They may also kill one of your gunners, or the pilot.

Unextinguished engine fires may spread to adjacent engines and to the rest of the Lancaster.

When you have been killed, the status and damage report will be displayed.

PLAYING A GAME

Press the fire button to leave any title screen, the dam scene after dropping the bomb, or the status screen after being killed.

Pressing the RUN/STOP and RESTORE keys simultaneously will return you to the title screens.

LEVEL SELECTION

The level of play is an indication of how difficult a game you want. There are three levels of difficulty.

1—Practice Dam Approach
2—Flight Lieutenant
3—Squadron Leader

To choose a level, press the number on the keyboard associated with the selected option.

PRACTICE DAM APPROACH OPTION

This option allows you to try the dam approach without worrying about Me110's, flak searchlights, or barrage balloons.

FLIGHT LIEUTENANT OPTION

The Flight Lieutenant option is to choose to start over the English Channel.

SQUADRON LEADER OPTION

In order to take off, set the flaps down, and give the engines full throttles and about half boost. Select the pilot screen and wait for the airspeed to build up.

You will be able to pull up the nose of the Lancaster once the take-off speed is reached. (Airspeed indicator will point straight up.)

Retract the landing gear and the flaps to increase airspeed. It is important that the throttles and boosters are lowered as soon as possible after take-off so as not to over-rev the engines. Pull back slowly on the joystick to start increasing altitude, and you're off.

FOR FLIGHT LIEUTENANT AND SQUADRON LEADER OPTIONS

When flying over enemy territory at night there are a number of considerations:

- If you fly at an altitude of over 1,000 feet you will give the night fighter radar something to lock onto. If you fly under 100 feet you risk hitting an object on the ground. The pilot's number will start to flash in the status screen if you start to fly too low.
- Searchlights may be knocked out by firing at the base of the light on the ground.
- Me110 attacks may be avoided by either trying to shoot it down or by performing a "corkscrew" in an attempt to out-manoeuvre the fighter.

DAM APPROACH

Three parameters must be set exactly during the approach for the bomb to skip properly over the water (see Fig. 12):

Speed—must be 232 mph
Altitude—must be exactly 60 feet
Distance—must be exactly 800 yards from the dam (indicated by distancing sights)

When making the dam approach make

FIGURE 12

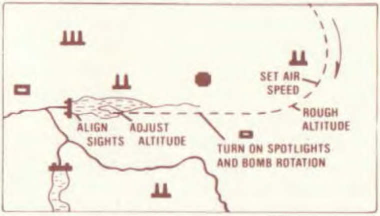


FIGURE 13

FIGURE 14

sure that the aircraft takes a long run down the lake to the dam so that all of the parameters (airspeed, distance, and altitude) may be set (see Figure 12). In order to set the approach parameters examine the following points:

- **SPEED**—Set the speed by adjusting the throttles. When the blue airspeed indicator hides the red needle, then your airspeed is correct. The red needle only appears when the bomb rotation switch is ON. (see Fig. 14).
- **ALTITUDE**—Make sure you are over the lake before reducing your altitude under 100 feet. Bring the aircraft down and fly level. Select the bomb aimer screen. Turn on the bomb rotation and the aircraft altitude spotlights. Adjust the aircraft's altitude so the spotlights converge and are just touching. The aircraft is now at exactly 60 feet. (see Figs. 6 and 13).
- **DISTANCE**—When you are heading directly at the dam going down the lake, the dam should appear on the horizon. Use the pilot screen to gently adjust the direction of the aircraft so the dam is near the centre of the screen. Then using the Front Gunner distancing sights (see Fig. 4), wait for the exact moment that the dam towers align with the distancing sights. When they align, push the bomb release (the fire button).

It is useful to keep checking the parameters (altitude, speed, distance) after they are set because of drift and error in the setting.

RESULTS OF BOMB RELEASE

If the bomb is not released under the proper conditions, one of two things can happen:

Coming in too fast, too low, or releasing the bomb too late will cause the bomb to hit the crest of the dam and skip into the valley beyond the dam.

Coming in too slow, too high, or releasing the bomb too soon will result in the bomb dropping short of the dam causing a harmless explosion in the water in front of the dam.

If the release of the bomb is within the acceptable limits described by Barnes Wallis, the bomb will skip across the water above the torpedo nets, hit the crest of the dam and sink to the prescribed depth of 300 feet, igniting the hydrostatic pistols which will detonate the bomb, destroying the dam (see Fig. 15).

FIGURE 15

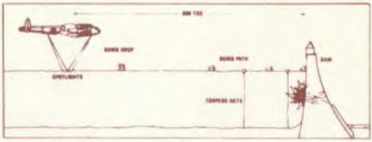


FIGURE 16

You can still reach bombing speed on 3 engines. However, this requires care, since they must be over over-revved. Set the throttles to maximum near the end of your run to get enough speed. After about 10 seconds the over-revved engine(s) will catch fire, but can still power the Lancaster. However, you must drop the bomb before your Lancaster catches fire.

Ground installations such as searchlights and flak guns can be dodged by banking hard left or right. Other objects such as barrage balloons can be shot out using the front machine guns. If barrage balloons get too close you will get caught by the cable and crash.

Always re-check your heading and position if you try to dodge night fighters or searchlights. It is possible for searchlights to be shot out of action.

FOR ALL OPTIONS

The key to playing the game is to keep switching between views that are useful at the time. For example over enemy territory flip back and forth between the front and rear gunner and now and then examine the pilot and navigator to make sure you are on course. Remember to examine the map before things get hot over enemy territory and plot a path that will keep you as far away from enemy installations as possible. Keep track of where you are on the map at all times.

Always keep checking the Front and Tail Gunner screens for fighters as sometimes there is little warning of their attack. Always answer a call from a gunner.

There are two ways of trying to deal with night fighters, firing at them and dodging them. Using the machine guns, fire a spray of bullets moving left and right as soon as you see a night fighter. Keep firing until it explodes, then stop to look for more. You can dodge night fighters by using a "corkscrew" manoeuvre. The "corkscrew" is a standard Lancaster manoeuvre that traces a horizontal corkscrew through the air. It is performed by diving left, pulling up, climbing, then diving from the right to the left. However, if you don't kill the night fighter, he will attack you again, until he runs out of fuel and leaves. If you miss too many, your gunners will be killed.

In order to fly straight after extinguishing a fire, decrease a throttle on the opposite side of the Lancaster (i.e. turn off engine 1, reduce throttles on 3 and/or 4), or adjust the trim (Squadron Leader Option only). Setting the trim to the highest position will compensate for losing both engines 1 and 2.

CERTAIN ASPECTS OF HARD-CASING EXPLOSIVE BEHAVIOUR AT DEPTH

By B.N. Wallis M.S.E., F.R.S.

PREFACE:

Current strategic theory holds that the bombing of enemy factories and centres of population beyond the battlefield will cause a collapse of production capacity and severe deterioration in civilian morale. The Air Targets Sub-Committee has identified three targets of special strategic significance: the Moehne, the Eder, and the Sorpe Dams. All are in the Ruhr Valley and account for the bulk of water supply to the monstrous German arsenal. For example, the German method of iron production needs between 100 and 150 tons of water to produce a ton of steel. These dams also provide domestic water to the Ruhr district.

The Moehne creates Moehne Lake. The level of this lake is maintained so that barges with coal and steel and tanks can travel to and from the foundries. If the dam were to be breached, the reservoir would empty 134 million tons of water in approximately ten hours into the lower Ruhr, causing wide spread disaster. There would be a serious shortage of water for drinking purposes and industrial supplies.

The Eder dams the Eder River to form Eder Lake—212 million tons of water. It controls the level of Germany's second most important waterway, the Mittelland Canal, and prevents flooding of surrounding agricultural land and towns. Several power stations lying along the river would be damaged or destroyed by a breach in the dam, and transportation on the Mittelland would be seriously hampered to the point of a virtual cessation of traffic. The Sorpe holds a similar position of importance.

A psychological as well as physical effect will be felt, should the dams be burst. Rumours will circulate regarding disease, water shortage, and loss of fire-fighting capabilities.

Countervailing arguments were submitted by high-ranking officers of Bomber Command, who drew the Sub-Committee's attention to the massive construction of the German dams, against which existing weaponry would be useless. There was considerable doubt as to whether the structure could be breached even if fissures were made in a gravity-type dam (the Moehne). These dams are also protected by nets against torpedoes.

The Moehne is 112 feet thick at the base, 130 feet high and 25 feet thick at the top. The Eder, also a gravity dam, is even bigger.

It is calculated that the bomb will not ricochet if the angle of impact exceeds 30 degrees, and therefore the best height is 10-15,000 feet. At this height the average error was 102-113 yards (if a 50-yard-long portion of the dam was attacked, only a 6% chance existed of hitting it—this is reduced to 2% during war-time).

Nonetheless, air attacks on reservoirs and dams have been deemed so important that the Air Targets Sub-Committee desires that the issue be "treated as urgent and of pressing importance."

DEVELOPMENT

It was clear that conventional techniques were unsuitable to the destruction of these very solid objects, and that an unsual approach would be required to solve the problem. Obviously, a kind of "explosive judo" would be needed, to use the vast weight of water behind the dam to assist in its own destruction.

An underwater bomb exploded on the upstream side of the dam would use the water pressure to magnify the shockwave against the dam. Such a bomb would produce a shockwave that would travel

through the side of the dam, smashing a hole through the masonry. However, experimentation revealed that if the bomb was even slightly too far upstream from the dam face when detonated, the surrounding water would damp and absorb the shockwave, making the explosion useless. A new delivery system, incorporating both weapons and techniques, was called for.

Early in 1942, I had the idea of a missile, which if dropped on the water at a considerable distance upstream of the dam would reach the dam in a series of ricochets, and after impact against the crest of the dam, would sink in close contact with the upstream face of the masonry. The germ of this idea came from a technique used by one of the greatest naval strategists of all time, Horatio Nelson, who discovered that by skipping cannon shot across the surface of the water it would gain distance and hit the target vessel just above the water line.

The bomb uses some of the same principles as a rock skipping across the water, but differs in that a rock skipping rotates along its vertical axis while the bomb rotates counter-clockwise along its horizontal axis. The essential parameters in delivering such a bomb are airspeed and initial approach angle. In theory, an appropriately constructed bomb capable of being carried by a heavy bomber could be delivered using this principle. Extensive testing has proven this to be correct.

I had projected a near-spherical steel weapon seven and a half feet in diameter. But the Ministry of Supply predicted a two-year wait for steel to make the case, so we settled on a smaller cylinder. The final version of the bomb is approximately 60in. long and 50in. in diameter, made of ⅜in. thick steel, weighing 2,650 lbs., and containing 6,600 lbs. of Torpex underwater explosive compound. There are three pistols, armed with the powerful initiating explosive Tetryl, set to explode at 30 ft., and a fourth self-destructive pistol set to go off 90 seconds after release. Total weight of the weapon is 9,250 lbs.

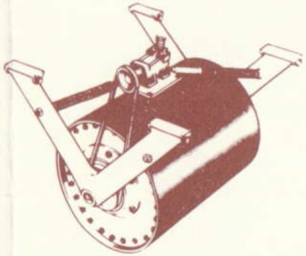
Bomber Command, in the person of Air Marshal Harris, assures me that its personnel and equipment can deliver the weapon on target within the specified parameters. To that end, a special squadron, number 617, has been formed and is currently undergoing intensive training for the exclusive purpose of conducting this single mission. Equipped with modified Lancaster III bombers and carefully selected on the basis of their low-level expertise, the men of 617 Squadron should have an excellent chance of success. Time, however, is of the essence, since the dams are now filling with water, and will be at the ideal highest level for only a few days in mid-April. I pray the indulgence of Cabinet to expedite this matter with all its powers, as the successful completion of this mission, will, in all likelihood, be the greatest strategic blow for freedom in the entire conduct of the war to date.

DAMBUSTING BOMB DETAIL

ED825/G carried out test dropping of the cylindrical mines, but was not selected to be one of the attacking aircraft. Underneath can be seen the mine-support pylons and belt drive mechanism for spinning the mine prior to release.

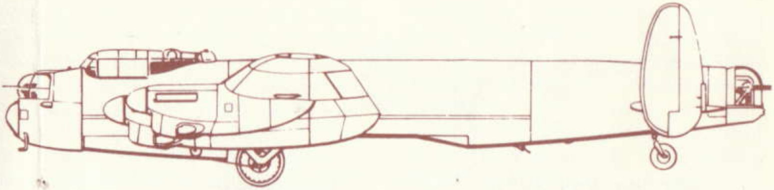
LANCASTER B. MK I/III (DAM BUSTER)

This modified version of the Mark III has been especially adapted for this mission. The original Mark I/III had H2S radar, a downward looking radar, used to obtain directional bearings from the local landscape. This has been removed in the Dam Buster Lancaster to increase the bomb load capacity. The bomb bay doors were removed and faired in to allow for two v-shaped caliper arms which protrude from the front of the bomb bay. These calipers hold the mine between their points and a 20-inch diameter disk mounted on the inside of these extremities engages a track at the end of the cylinder. A hydraulic motor attached to the track (used for steering the hydroplane operator in submarines) is mounted on the floor of the fuselage. This motor is used to spin the mine backwards at the required 500rpm.

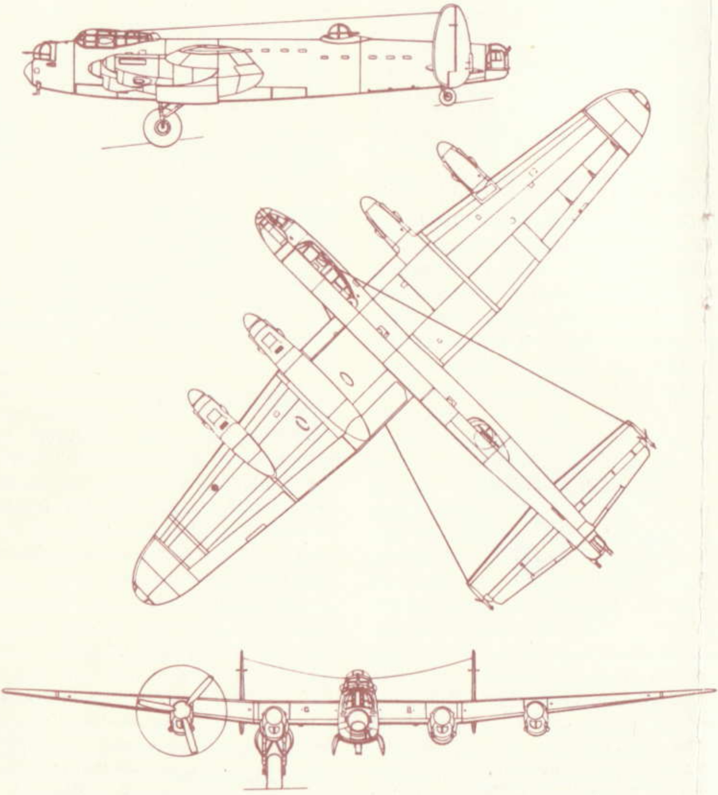


LANCASTER BOMBER

Because of the difficulty and importance of the mission the latest and most sophisticated bomber, the Lancaster Mark III was chosen. Although it was a bomber, according to Gibson it could manoeuvre as well as most German fighters.



LANCASTER B MK I/III (DAMBUSTER)



SPECIFICATIONS OF THE LANCASTER MK III

Crew Seven

Powerplant Four Rolls-Royce Merlin 24s

Dimensions

Span 102 ft.
Length 59 ft. 6in.
Wing Area 1,300 sq.ft.

Weights

Empty 37,000 lb.
Normal Load 65,000 lb.

Performance

Max. Cruising Speed 275 mph
Service Ceiling 24,500 (with special superchargers)
Range 2,530 miles with 7,000 lb. load
1,730 miles with 12,000 lb. load

Armament Eight 0.303 machine guns
Two in nose turret
Two in dorsal turret
Four in tail turret

REPORT ON THE FORMATION AND TRAINING OF 617 SQN. WITH NOTES ON THE LOW-LEVEL PERFORMANCE OF THE MODIFIED LANCASTER BOMBER

By Guy Gibson, W/C, RAF

Wing Commander G. Gibson, DSO, DFC, was chosen by Air Marshal Harris as Commanding Officer of "Squadron X." He began assembling the hand-picked crew, some of whom were chosen by Gibson himself, at RAF Scampton on March 21, 1943. The crews range in age from 20 to 32. There are currently 21 pilots serving with 617—three from the Royal Australian Air Force, five from the Royal Canadian Air Force, one from the Royal New Zealand Air Force, and twelve from the Royal Air Force. This last figure includes two U.S.-born Squadron Leaders, Young and McCarthy.

The speed with which the squadron had been formed presented various difficulties. Initial facilities at Scampton were quite limited, and indeed, until the arrival of the Type 464 Provisioning Lancasters, only ten aircraft on loan from other squadrons were available to the men. Their accommodations were less than luxurious, being a group of condemned wooden billets of First World War vintage. Each hut housed 24 men. In the interests of bringing the motley group together, it was suggested that each night they do P.T. before retiring. A newcomer to the crew who arrived one evening in the midst of these exercises was convinced that he had "stumbled on an annex of the local mental institution."

The 700 men of the squadron raided other squadrons for furniture—beds and chairs. With Air Vice Marshal Cochrane's intervention, supplies such as uniforms and blankets for 617 were given top priority. Official pressure resulted in the appearance of spark plugs, tools, starter motors, bomb trolleys and winches.

On March 27, 1943, I was issued with "most secret" written orders, which outlined the plan of attack without naming the targets

> "No. 617 Squadron will be required to attack a number of lightly defended special low level targets over enemy territory in moonlight with a final approach to the target at 60 ft. at a precise speed, which will be about 240 mph."

It was noted that the exact speed would be determined later and visibility might well "not exceed one mile." It was assumed that aircraft would be despatched at ten-minute intervals to attack the first target. When this was destroyed, subsequent aircraft would be diverted in the air to the next target and so we had to ensure that navigation was accurate in moonlight, at a height which would be as secure as possible against fighter attack. Air position indicators would be available, but training was to proceed without them. Accordingly, the squadron has been performing low-level night flying exercises almost non-stop to date. The efficiency attained in these areas has been most gratifying.

According to Barnes Wallis's specifications of the delivery of the bomb, each Lancaster must release the bomb at 240 mph, 60ft above water and exactly 800 yards away from the dam.

Visual sighting at night is difficult to impossible because of the existence of a sort of a grey no-man's land between the surface of the water and the aircraft flying so close at high speed. Several different techniques were tried and all were rejected due to measuring error or impracticality. Finally, a simple solution was found, using two spotlights, one at either end of the

aircraft. As the aircraft flies over the water the spots shine down upon the surface of the water. The spotlights are angled such that when the two spotlights touch, the aircraft is flying at 60 ft. with virtually no error.

The distancing problem had a similar trivial solution involving angles. The front gunner, using the bomb aimers bubble, will sight on the twin towers of the dam, through a Y shaped distancing sight. When the twin towers of the dam align with the markers on the end of the sight, the aircraft is exactly 800 yards from the dam, again with virtually no error.

The conventional airspeed indicator used by the Lancaster is accurate enough to render an airspeed reading within acceptable tolerances.

Therefore, I have the honour to report that 617 Squadron is, in all respects, ready for battle.

INTELLIGENCE – TACTICAL REVIEW

prepared by J.A. Franklyn-Smith, Sqn. Ldr. (Int)

GERMAN DEFENCE SYSTEMS

Light anti-aircraft pose formidable problems for low flying aircraft. The basis for nearly all German 20MM models is the FLAK 30, capable of 120 rounds per minute with a ceiling of around 6,630 feet. A wide range of heavier flak guns, including those mounted on concrete towers or formed into mobile railway batteries will also prove dangerous if the crews stray too close to military or industrial centres.

An integrated defence system manned by the Luftwaffe has been developed in Northern Europe. Co-ordination from local radar operators directs night fighters, anti-aircraft guns and searchlights.

Two types of German radar can detect incoming Allied aircraft and co-ordinate flak, searchlight and intercepter aircraft.

A) Freya stations on the coast give the direction and range of attackers up to 100 miles but are unable to determine altitude.

B) Mobile Wurzburg sets with a range of 45 miles are used by ground controllers inland and many fighters have airborne Lichtenstein sets accurate up to two miles.

So the 617 Squadron Lancasters involved in Operation Chastise must contend with this defensive organisation: Fighters with airborne radars, and a strong array of flak weapons assisted by search-lights and radar and often grouped around vulnerable targets.

One advantage to the 617 Squadron is that the German ground radar is ineffective at tracking aircraft below 1,000 feet, especially in the relative haven of valleys near the targets. Also, airborne night fighters equipped with Lichtenstein radar sets are not effective in scanning downwards from their regular operating altitude. Thus, flying as low as possible at night offers the Lancaster the optimal chance of survival.

From the inception of the operation, a Mosquito reconnaissance aircraft has flowndaily at 25,000 feet over the dams, taking photographs of rising water and the defences. The Mosquitoes are flown in such a manner that to the Germans it appears they are crossing the dams by accident.

During the afternoon of May 14, a photo-reconnaissance operation was flown at 30,000 feet over targets "in the Soest area" and on the morning of May 15 the Dortmund, Duisburg and Soest regions were photographed so as not to draw attention to the dams. This information was combined with other results to show that there was no unusual defensive activity in the target area.

CATHODE-RAY TUBE SIMULATION SYSTEMS – THEIR ROLE IN AIRCREW TRAINING

By Sydney H. Prendergast, Ph.D.

The cost of aircrew training in a wartime economy is unacceptably high, in terms of equipment, fuel and risk to personnel who are, as they say, new at the game. We at the Shipton-on-Stowe Research Establishment propose to reduce these costs and improve efficiency through the use of an image-projection device, the Cathode-Ray Tube.

The trainee will sit at a console in front of a phosphor screen on which will be projected tactical situations, as realistically presented as possible. He will respond to these through a "joystick," not unlike an aircraft control yoke, and his responses will be transmitted back to a panel of expert "analysts," who will assess his response, determine its effects in a "real-life" situation, and alter the project image he sees accordingly. I foresee various rooms set up with "television" cameras (a distasteful American term, but their research is ahead of us in this area) pointed at simulation boards, instrument panels, or rear-projection screens, all linked up to the trainee's console, and have performed the "thought experiment" of running through an entire simulation of an imaginary low-level raid on some large, strategic German site, for example, one of the dams along the Eder River. I have taken the liberty of appending a copy of the instructions for a "game" or simulation of this nature, and am confident you of the War Cabinet will find it worthy of increased funding.

Designed by Sydney Development Corporation.

Manufactured in the U.K. under licence from the International Computer Group by U.S. Gold Limited
Unit 10 Parkway Industrial Centre,
Heneage Street, Birmingham B7 4LY.